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BETTER FRUIT

VOLUME XIII

NOVEMBER, 1918

NUMBER 5



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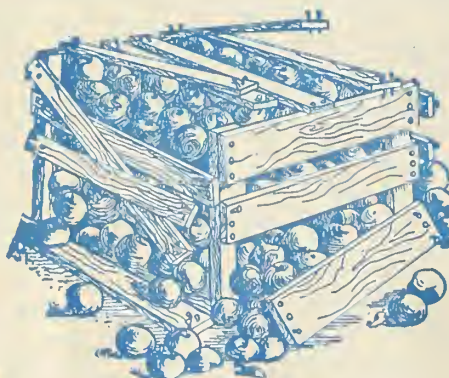
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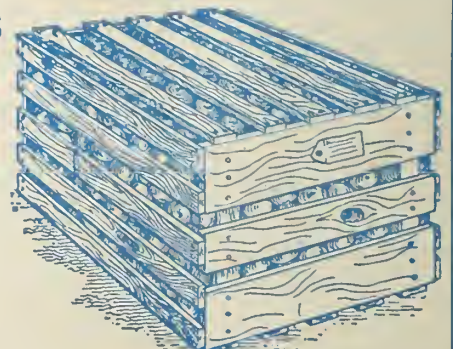
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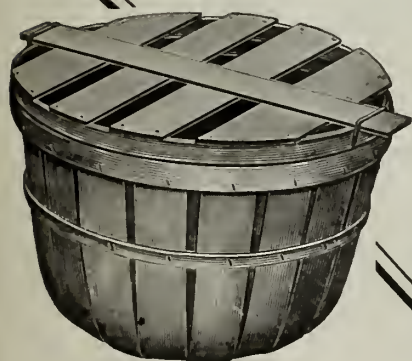
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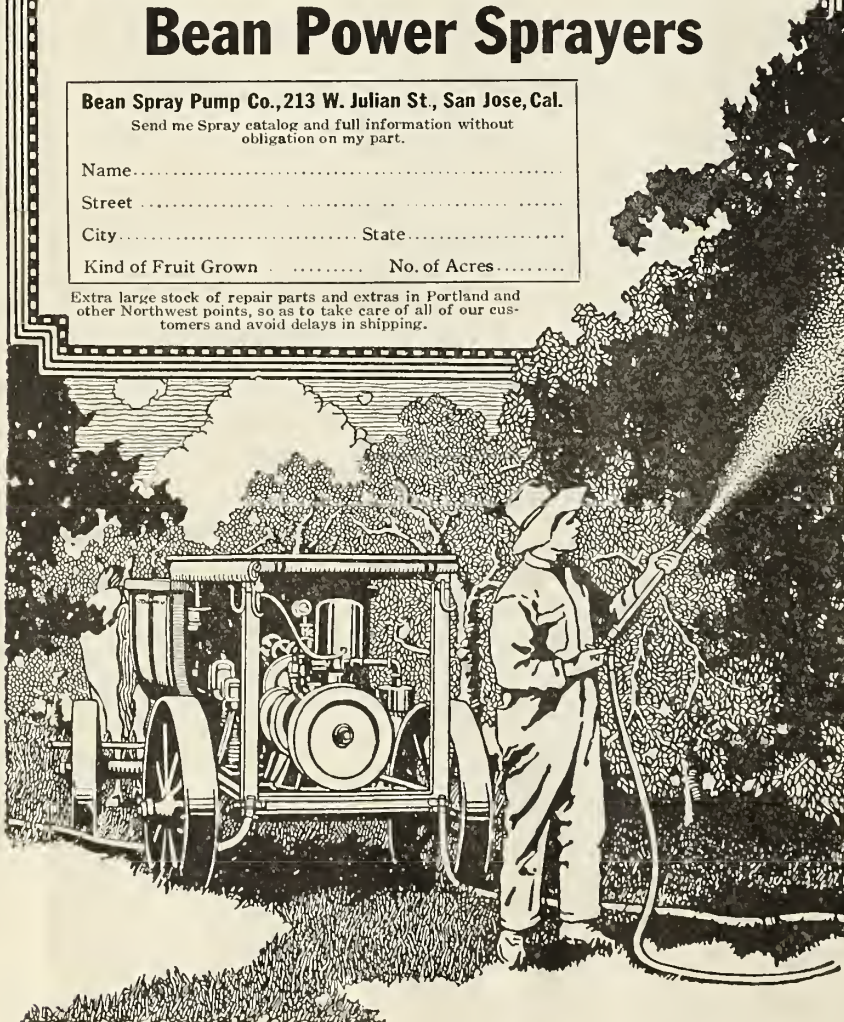
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Pruning the Bearing Tree

By C. I. Lewis, Chief Division of Horticulture Oregon Agricultural College, Corvallis

IN treating the question of pruning it is wiser to deal largely with principles and allow each grower to work out his own special application. However, the field of pruning is so large and the time is so short before the pruning season begins that I am going to deal very largely this time with some applications of the general principles of pruning, choosing such applications as I feel would perhaps reach the larger number of our Western growers, and giving as little attention as possible to the question of principles.

During these war times the problem of cost of labor is uppermost in the minds of most fruit growers. Labor is so high and so scarce that it must be utilized to the best advantage. We must not, however, carry the question of economy to such extremes that it will prevent our producing high-quality fruits, as there seems to be a good market at profitable prices for such fruits.

One of the questions which is very important at this time is, how early can I safely begin my pruning? If the pruning period can be spread over a long time it will mean hiring less labor, because the grower can do more of his own work. Under normal conditions the best practice seems to be to wait until the danger of severe freezing is over, which is most apt to occur during December and January. One probably runs a less chance of injury by pruning after that period in those sections subject to freezing winters; however, in most districts of the Pacific Northwest there has been only one winter in the last twelve years, namely that of 1908, when much damage occurred from early pruning. During that winter considerable die back and heart rot was started, due to the fact that the early-cut surfaces were easily damaged by the severe winter, and rots got a foothold in the trees. With the present great scarcity of labor one would probably be justified in beginning as soon as most of the leaves are off the trees. It would be better, however, to confine such pruning to the older, more mature trees and the portions having the better air drainage. We should also remember that it is unwise to prune trees when they are frozen. By beginning early the grower would have late fall,

all winter and a portion of the spring up to the time the leaves are breaking in which to do the pruning.

In pruning our bearing fruit trees, the bud and the fruit spurs are two parts which we should give special study. Some investigations that we have made at this experiment station would indicate that the percentage of spurs that bloom from year to year decreases as such spurs get older, and that the percentage of spurs which bears fruit decreases at an even faster rate as they get older. In other words, some spurs may have the vitality to produce a bloom but have not reserve energy enough to set or, after setting, to mature a fruit. Our investigations have shown that the amount of growth that a spur makes for a given season has a close relation to its bearing the following season. There is also a correlation between bearing and length and diameter of spur. Branches that have a large diameter have stronger spurs and bear more fruit. From these results it would seem that the spur to a large extent acts as a barometer, and that a study of their vitality and the nature of the wood on which they are borne will determine to a certain degree what pruning should be given such trees. One should attempt to develop a fair amount of new wood annually in order to provide for the necessary increase of new buds and spurs essential to the best tree development and should constantly keep in mind the revitalizing of some of the older spurs on the trees.

General pruning practices will mean either a heading back, a thinning out, or a combination of these two. If one simply desires strong sprouts and a new top, so to speak, then heavy heading back will produce that result, but if one really desires more development of spur and bud in the immediate future, then a moderate heading back would be more desirable, since one would be removing a much smaller number of buds and spurs and would discourage the formation of a large number of sprouts, which in turn would require heavy heading back. Likewise heavy thinning out would naturally remove more buds than a moderate or light thinning out. Let us

apply this idea of heading and thinning to some of our standard varieties. Take the Jonathan and Wagener as typical of varieties which often bear large quantities of fruit from axillary buds, which would be found on the one-year-old wood. It is evident that a heavy heading back of such varieties would remove a large percentage of the crop, and this is just what is happening in many an orchard in the Pacific Northwest. The tonnage is being greatly reduced by such pruning. Take these varieties from six to ten years of age for example, and they could go without heading for several years to good advantage, and would bear bushels of fruit to the tree which otherwise would be sacrificed. Of course one can carry the non-heading to the extreme. When heading is done with such varieties, it is often wise to do it soon after the apples have formed, we would say in early June. In this way a good crop of apples can still be saved and new wood developed for the next year's crop. The Newtown, however, offers an entirely different problem; severe heading in of this variety does not so much remove fruit buds which are already on the tree, but it has a tendency to force out an excessive number of laterals. As a result many of our Newtowns are nothing but brush-heaps, and while they continue in this condition will produce little or no fruit often until they are twelve or fifteen years of age. Reduce the heading to little or nothing for a few years and have the pruning consist more of thinning out, and the trees will begin to bear. In thinning out some of these thick Newtowns, however, two plans can be followed. One is to thin out much of the lighter brushy wood, and the second is to take out bodily a few of the large branches which sooner or later should be sacrificed. Generally speaking, I believe the latter practice would be the more practical, as it still opens up the tree and does not remove as many fruit buds. Some of these smaller branches of Yellow Newtowns are the first branches to bear and the constant thinning out of such wood deprives the trees of a large percentage of their buds and spurs and keeps them constantly producing vegetative growth instead of

buds and spurs which produce fruit. The Spitzenberg represents another type. Here we have a tree, the branches of which become long and rangy, producing few laterals, thus having too small a bearing surface. This tree also has weak spurs. A large percentage of the spurs on any Spitzenberg tree becomes devitalized after three years. The Spitzenberg needs much heading in in order to force out laterals and to constantly bring out new wood which will have plenty of bearing surface. I had the opportunity to inspect some Spitzenbergs forty years of age, and I could see by looking over these trees what was going to happen to a large percentage of our Spitzenbergs unless we change our methods of pruning. The trees largely grow much as does the peach, forcing out long, naked branches on which a few twigs bearing weak spurs are borne. I fear too many growers are prone to leave too many scaffold branches in their Spitzenberg trees. I would try to combine my summer and winter pruning in such a way as to produce shorter, stockier main branches, each bearing more laterals. Various parts of the tree should from time to time be headed in or thinned out so as to renew the spurs or revitalize spurs in that portion of the tree. The Ortley represents another type of tree which naturally grows stocky, bearing its fruit and spurs close together on the older wood. Here some heading can be practiced without disturbing the tree, and occasionally where a tree becomes somewhat rangy it is wise to head it in and force out a few laterals which in a course of time will become thickly studded with fruit buds and spurs.

In our pruning we must constantly remember that it is desirable to study each branch of our tree and determine its relation to the whole tree. If some of the main strong branches of the tree are growing at the expense of short or weaker branches that we would like to develop, suppress the strong branches by heading them back or otherwise reducing their leaf surface; this will encourage the weak wood by giving it a larger percentage of the leaf area, which means more growth. Pruning should be well distributed throughout a tree, as a direct stimulation coming from a cut is found close to the point where the cut is made, and if we want a general stimulation of the fruiting system of a tree we have got to make numerous cuts. An example of the above can be nicely illustrated as follows: If you have five main branches on a pear tree and head in strongly or dehorn one of these, the result will be that just below the cut long suckers or watersprouts will develop, but on the uncut branches little or no change will be seen in the spurs. It is largely by distributing our pruning so as to include the other branches that we can get a revitalizing of their parts.

It would probably be well to say a few words in regard to trees six to ten years of age. I have already indicated such trees are generally overpruned. Thinning rather than heading will bring better results, and this thinning

may be done in winter and also to good advantage in early summer. By confining our pruning to summer and winter thinning and a little summer heading occasionally most varieties can be made very productive.

As many growers have pear trees, a few words in regard to pears will be acceptable. The pear has a tendency to produce too many spurs. Anjou, Bartlett and Winter Nelis often produce a very large number of spurs on a small quantity of wood. Gradually these spurs become weaker and weaker and often set their fruit very poorly, and we say we have a pollination problem

on our hands. Our experience has shown that a thinning out of such spur clusters seems to revitalize those which are left on the tree, they begin to make a better growth, the fruit on the trees becomes larger and close to the cuts new shoots are grown out which will in turn form new spurs. This is a good illustration of the statement recently made that the stimulation from a cut comes nearest the cut and frequent cuts are needed to revitalize the spur system of a tree. This work can often be done to best advantage with hand shears. There seems to be a general feeling that

Continued on page 18

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WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

The Apple Tree Anthracnose and How to Control It

By Leroy Childs, Entomologist and Plant Pathologist, Hood River (Oregon) Branch Experiment Station

IN many sections of the Northwest the most pernicious invader of the apple orchard at the present time is apple-tree anthracnose or canker. The cause for this invasion is not due to the fact that control measures are unknown or impossible to attain, but are due entirely to carelessness or neglect on the part of the orchardist. Anthracnose is a disease of no great moment to the competent and thorough-going orchardist. Its control is easily and readily attained if proper methods of procedure in spraying are practiced and followed year after year.

Anthracnose, or apple canker as it is commonly called, is a most serious disease to tolerate in the orchard. Unlike losses resulting from codling moth and aphid infestations, or those resulting from an apple-seab epidemic, the losses caused by this disease are more fundamental. The injury resulting from the presence of the former pests detract from the orchardist's net returns for the season, while those resulting from the latter cut into the capital invested through the loss not only of trees but to the reduction of the bearing area of the trees.

War-time shortage of labor and high costs of materials tend to influence the grower toward the omission of a spray now and then. The last spray, the one for the control of this disease, is more likely to be object of neglect as its application comes at a time when harvesting and packing of the crop is at its height. Disagreeable weather also must be contended with. Regardless of these facts the growers should plan their work that spraying may follow harvesting at the earliest possible period that control be obtained.

This particular canker disease of the apple is confined chiefly to apple-growing sections west of the Cascade Mountains, and its development reaches its height in sections of abundant rainfall. Certain varieties apparently suffer more severely from this disease than do others. In the Hood River Valley the Spitzenberg is much more subject to infection than other varieties grown.

The economic losses resulting from the occurrence of this disease are difficult of estimation; it is considerable, however, and in badly-neglected orchards have depreciated in value fully one-half to two-thirds their original valuation. The direct injury to the tree consists of a partial to a complete reduction of the functioning or fruit-producing area of the tree. This reduction is usually gradual; at first a few cankers appear on the main branches. As the number of infections increase, these cankers, which have killed all of the living bark beneath them, eventually become so numerous as to join one another. A girdling of the branch occurs and its death results. The disease proceeds in this manner until nothing remains but a framework of dead, scarred limbs. Two or three seasons of neglect will often make necessary

the re-heading of a tree due to the presence of so many canker covered, practically functionless, scaffold limbs. The permitting of infection of the main branches of the tree, even though control of the disease is eventually accomplished by proper spraying, gives the tree a very unsightly appearance. These cankers remain open, shredded wounds for many years, offering complete overwintering protection to such apple pests as the codling moth and the woolly aphis, the presence of which increases the chances of losses from these sources. In older orchards the large limbs seem to be the object of the greatest amount of infection; the main trunk suffering to a less extent. In young orchards the trunk is quite often attacked and completely girdled, resulting in the immediate killing of the tree. The fruit is also attacked by this fungus, which causes a brown storage rot,

resulting often in the loss of much fruit after it has been packed. The spores are liberated by the first rains before the fruit is picked, upon which they lodge, germinate and cause decay. The only way to avoid losses from fruit infection is to keep the orchard free from cankers.

The disease is caused by a fungus which attacks apples for the most part, though occasionally cankers of this disease are found upon the pear and quince, and cankers have been produced by investigators, by inoculation, on peach, cherry and prune. Natural infections in the case of these latter fruits have never been found. Infection occurs during the fall soon after the rainy weather sets in. This probably occurs most extensively during the months of November and December, though rains occurring before this time permit some infection. The fact that during some seasons rather extensive rains occur before the fruit is harvested has led many orchardists to wonder if benefits would result in applying a spray following those rains. The answer to this query should be—by all means spray. It is more than probable that only a very small fraction of the spores have been liberated by the first of November and a large amount of protection can be gained by spraying even as late as the first of November.

The fall rains cause a disruption of the small pimple-like sacks which can be found on the surface of an anthracnose canker, liberating countless numbers of spores which are therein contained. These spores are either washed down onto other parts of the trees or carried by wind, insects or birds to a favorable location, where they germinate much as a seed would do. The little rootlet-like projection which is thrown out usually enters a lenticle or pore-like opening in the bark and soon establishes itself in the healthy tissue of the plant. After the penetration of the host plant the application of a spray to the surface of the plant will do no good. The spray must be applied to the limb of the tree before the spore is deposited upon it. When the spray coating is present the germinating spore sends its little rootlet out, strikes the spray coating before reaching the plant tissue and is immediately killed. The spray, therefore, acts only as a preventive coating and the essential point to bear in mind is that it must be there ahead of the spore if control is to be obtained.

Young cankers can be found developing on infected trees during the latter part of November. At this time these appear as small reddish-brown spots. The bark and cambium beneath will be found wet and discolored, extending down to the woody portion of the twig or branch. During the winter these spots grow little, if any, but during March and April extend rapidly, becoming elongated in shape when mature,



Photo Oregon Experiment Station

FIGURE 1—Anthracnose canker on apple branch. Note the characteristic pustules on the bark surface.

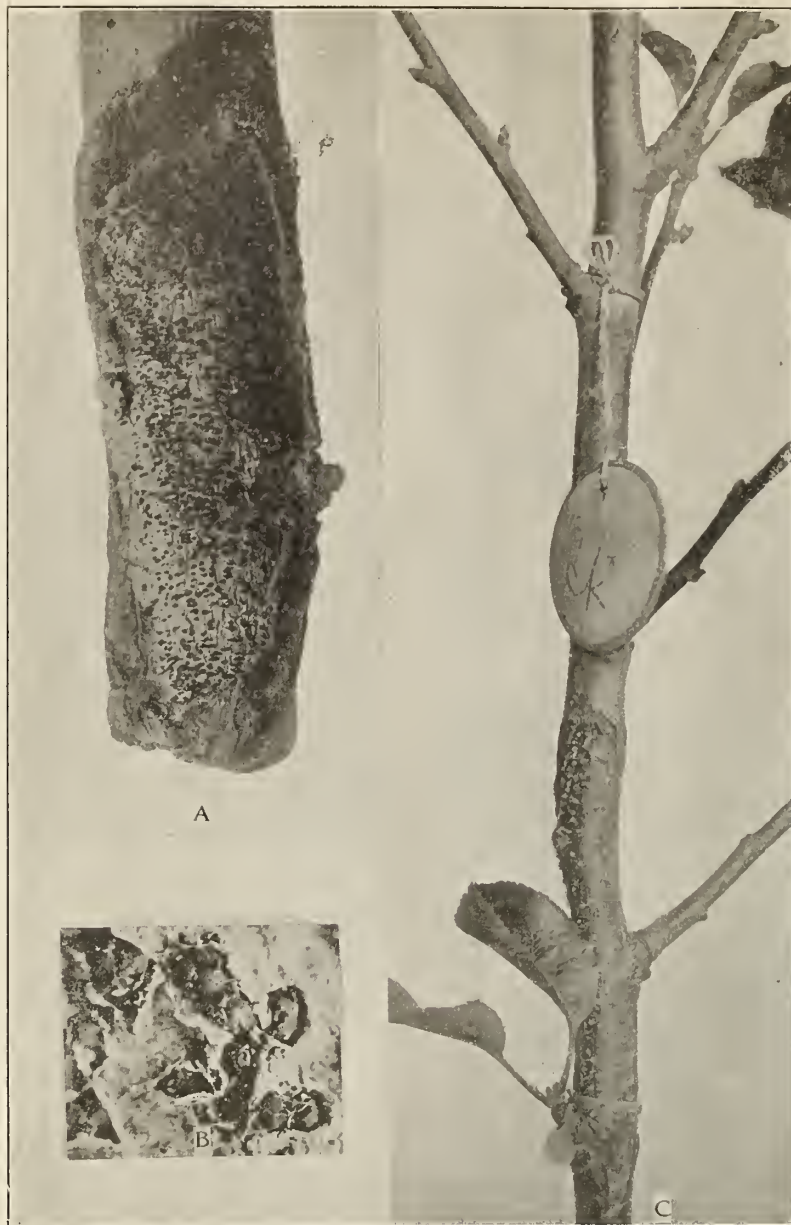


FIGURE 2—(A) Two-year-old canker showing opened spore pustules. (B) Pustules enlarged five times. (C) Young Spitzenburg inoculated with the fungus. Note wound of check puncture at top of figure.

and of variable sizes, ranging from one inch to eight or ten inches in length. At first these cankers are watery, drying as summer approaches, eventually becoming sunken areas mottled by a series of differently colored concentric rings. The spread of the fungus ceases as soon as the cambium becomes active in the spring. Mature cankers have a definite, limiting crack separating them from healthy tissue. There is usually a definite ridge surrounding the canker caused by the slight formation of callous tissues at the edge under the diseased bark. The bark is dry, sunken and dead, being darker in color than the living bark surrounding. Thickly scattered over the surface of the canker are little elevations. These are at first more or less conical in shape, later bursting the outer layer of bark (Figure 1), exposing a creamy-colored mass of fungous tissue. These are the fruiting structures of the fungus in which spores are produced in great

numbers. As time passes there is a gradual shredding of the diseased bark in the cankers. This tissue eventually falls away, leaving a large open wound. These are gradually healed over through the extension of surrounding healthy tissue, the accomplishment of which usually requires several years.

In view of the fact that spore dissemination occurs during the fall a spray applied at this season of the year will be found effective in controlling the disease. Bordeaux mixture used at the rate of six pounds of lime, six pounds of bluestone to fifty gallons of water, immediately following harvesting of the fruit will keep the disease well under control, provided the spraying is practiced regularly and thoroughly.

Often orchards are permitted to become somewhat badly infected with the disease before its presence becomes known to the owner. In the case of such a condition it is advisable to apply

some sort of a protective covering before the fruit is harvested in order that a spray may be present before the occurrence of early rains and before it is possible to apply the regular fall application. The greatest drawback in using a spray just before harvest time is that of giving the fruit an unsightly covering of spray just before picking. This, in the case of a home-made bordeaux application, necessitates the wiping of a good deal of fruit before it can be packed. Again, the application of this bordeaux spray on red apples has been found to mottle them considerably owing to the fact that they fail to color under the spots of spray. The writer has been trying out some different materials recently in order that these two chief difficulties may be overcome. Of the different materials tried Burgundy mixture has given the most promise. The fruit was found to be in just as good shape where this





Photo Oregon Experiment Station
FIGURE 3—Anthracnose rot on fruit of apple.

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material was used as where arsenate of lead (an application of which was found necessary in September at Hood River this year) was used. The mottling resulting was insignificant and by the time the fruit was picked, sorted and packed, little spray remained. It will take time to determine whether this spray will be effective—theoretically at least it should be productive of the desired results and it can be used with perfect safety and without inconvenience. A spray applied at this season of the year in many orchards is done with much difficulty. The many props

and heavily-laden branches practically prevent the spraying without the loss of some fruit. Heavy foliage at this season of the year makes the coating of the branches difficult. If the disease, however, is gaining headway its control certainly is worth the sacrificing of a little fruit and the indulging in a little hard work in working the spray machine through the orchard.

Burgundy mixture as used during the past season was made as follows: Three pounds salsoda; three pounds bluestone; 100 gallons of water. The materials are dissolved separately, as is

done with the bordeaux mixture, and placed unmixed in the spray tank when it is well filled with water. Care should be taken in mixing the materials; fruit can easily be injured at this season of the year by improperly mixed copper solutions.

As in spraying for other troubles, timing of the application and thoroughness of execution are the two great principles involved if the desired results are to be obtained. If these principles are religiously kept in mind anthracnose will never be a contender in the apple orchard.

Effect of Cross-Pollination on the Apple

By W. H. Wicks, Formerly Horticulturist University of Arkansas

THIS article reports the results of investigation for three years of the "Effect of cross-pollination on size, color, shape and quality of the apple." It is the second publication of a series on apple-pollination problems begun at the Arkansas Experiment Station in April, 1914.

The necessity of cross-pollination of the apple has been set forth by investigators, both in this country and abroad. Considerable literature on this subject has accumulated. Data collected, also, by this station since 1914 shows the necessity of cross-pollination. Growers are now aware of the importance of cross-pollination and are planting commercial apple orchards in alternate varieties. More bees are kept each year by the more progressive orchardists, as it has been demonstrated that insects, especially the honey bee, are most beneficial in promoting pollination. Where this occurs, the question arises, What is the immediate influence or effect of the pollen of the male parent on size, color, shape and quality of the fruit of the female parent? This study was conducted during 1915-16-17 in a typical commercial orchard at Springdale, Arkansas.

The immediate effect of cross-pollination is thought by some to be most strikingly manifested by such phenomena as a red band on an apple with a yellow background, or in reverse cases where a yellow band is distinct on an apple with a red background. In order to choose varieties for this study to make the results commercially practical it was necessary to choose varieties which blossom at the same period and planted for commercial purposes in this region. The Ben Davis, Jonathan, Winesap and Grimes were therefore selected, which are the varieties meeting the above requirements. The commercial value of this study is based upon the detriment or advantage of a pollen of any certain variety increasing or detracting from the size, color shape or quality of the fruit of the female parent. In case the influence of the pollen is manifested in the present fruit crop, orchardists may choose varieties and plant in such a way that the greatest benefit of cross-pollination will be received on factors under discussion.

This problem was to ascertain the effect of the pollen of the male parent

of the apple on size, color, shape and quality of the fruit of the female. The apple when grown under different conditions varies in all of the above characters. The influence of foreign pollen has been studied to determine its power in causing such variations. In Northwest Arkansas some varieties grow long one season and another season they will be practically round, with the absence of characteristic irregular ribs and prominent lobes on the calyx end. In some seasons, the apple will be lacking in color, size and flavor. Is this due to the kind of pollen or other factors?

Plan of Investigation

The orchard chosen for this work at Springdale, Arkansas, contains Ben Davis, Winesap and Jonathan as the major part of the planting. Other varieties are Mammoth Black Twig, Gano, Huntsman, Rome and Stayman Winesap. It is 27 years old and is considered a typical commercial orchard of this community. All varieties have grown well. The pruning, spraying, cultivation, fertilization and general cultural methods have been practically the same for the past ten years. It has remained in the hands of the present owner during this period. The soil is a silt loam mapped as the "Fayetteville Series" by the U. S. Bureau of Soils. It is fairly well drained, but productive, as indicated by the growth of the trees and the general farm crops that are produced in the vicinity on the same type of soil. The health and vigor of this orchard is good. Its crop production is good, having a record equal to any of the commercial orchards in this district. No change during the experiment was made in any of the cultural methods used in this orchard. The Grimes trees used in this experiment are planted in a block of 35 acres, two miles west of Springdale, on similar soil and are twelve years old.

To produce fruit with known parentage it is necessary to make hand-pollinations. The greatest number of the following crosses were made each year:

Ben Davis x Ben Davis
Ben Davis x Jonathan
Ben Davis x Grimes
Ben Davis x Winesap
Jonathan x Jonathan
Jonathan x Ben Davis
Jonathan x Grimes
Jonathan x Winesap

Grimes x Grimes
Grimes x Ben Davis
Grimes x Jonathan
Grimes x Winesap
Winesap x Winesap
Winesap x Ben Davis
Winesap x Grimes
Winesap x Jonathan

In addition to these varieties being of leading commercial importance they possess intense color, quality and characteristic shape as developed in this environment. The Grimes, developing a uniform rich yellow color, it was thought that the pollen from a red variety like the Jonathan and Winesap would manifest itself when placed on this variety, if such a phenomena is possible. The yellow of the Grimes would likewise be dominant in the coloring of deeply-colored red apples when the Grimes was used as a male parent. By using these varieties the size, form and quality would likewise be readily apparent on the fruit of the female parent in case the influence of the male pollen is present concerning these characters.

The trees of each variety were numbered alphabetically. Each year self-pollination was made on each tree in order to secure self-pollination specimens as a standard of comparison for the specimens which were produced by using another pollen. For example, a number of blossoms of Jonathan tree "A" were hand-pollinated with pollen from this tree, and on the same tree hand-pollinations were made by using Ben Davis, Winesap and Grimes. This method each year gave self-pollinated specimens for each variety. Pollen was also used from all of the trees worked upon for that variety, placing upon another variety, using the tree as a unit. For example, pollen from Grimes tree "B" was placed upon Ben Davis tree "B." This gave a comparison of the entire crop of individual trees which enabled to detect tree variation, if present, among the varieties studied.

Recognized practices of emasculation and hand-pollination were maintained each year. Before the blossoms opened on the tree, twigs were gathered from each tree for each variety and placed in the greenhouse to hasten the development of pollen for use when the stigmas became receptive on the trees in the orchard. The varieties were kept separate in the greenhouse by placing the twigs in glass jars containing water and placing them under a cloth cage. Each day, as the pollen matured, it was collected by jarring into a small vial, by the use of a camel's-hair brush. A label giving the

variety and date of collecting was placed upon each vial. After a cotton cork and camel's-hair brush was securely fastened in each vial, the pollen was sent to the orchard for use.

Blossoms were chosen for emasculation and pollination which grew on the outside of the tree and located from eight to fifteen feet from the ground. They were chosen around the tree to avoid the influence of any advantage as to location that some fruit might possess on the tree. All blossoms were removed, except two to a spur. The thumb and forefinger were used in removing the petals which were just about to part. A small pair of forceps gave the most satisfaction in removing all of the stamens from the blossoms. Great care was taken not to injure the sepals or pistils during the process of emasculation. A two-pound paper bag was then placed over the blossoms, tied securely, and labeled with a metal-rimmed tag. The paper bag protected the pistils from being fertilized by other agencies, while the tag contained the record. Effort was made each year to hand-pollinize these blossoms from two to three days from the date of emasculation. It was observed, however, that good results were secured by pollinizing the blossoms the same day of emasculation, provided blossoms chosen were advanced to the point where petals were almost separated. The weather conditions interfered with the emasculation and pollination work considerably each year. The most difficult problem, however, of hand-pollination work is securing sufficient pollen. This is particularly true of the Winesap variety. Where weather conditions prevented applying the pollen after the blossoms were emasculated more than three days such blossoms were destroyed.

After all danger of pollination from other sources was over, the paper bags were removed. As a rule, the bags were removed each year from five to six days after the pollen was applied. The hand-pollinated apples were then permitted to grow without further attention until harvest time. At this time the hand-pollinated apples were gathered, each with its own label, and taken to the laboratory for detailed study. They were kept in storage not to exceed thirty days. The technical description of each apple was made according to Shaw. The record of the descriptive work of the hand-pollinated specimens appears in Table II.

Explanation of Data

The data presented in this article consists of two tables. Table I contains the performance record of the pollination work, while Table II is composed of the description of both self-pollinated and crossed specimens.

A two-year survey of twenty orchards in Washington County produced evidence to support the fact that variation is caused more by other factors than the pollen of the male parent. A study of 94 specimens by the writer representing 14 varieties produced at the Idaho Experiment Station in 1915 supports the conclusions given in this

TABLE I.—POLLINATION DATA FOR THREE YEARS SHOWING NUMBER OF POLLINATIONS MADE, NUMBER OF FRUITS HARVESTED AND PER CENT OF FRUIT SET

Variety Crossed		Number Pollinations				Number of Fruits Harvested				Fruit Set, Per Cent			
Female	Male	1915	1916	1917	Tot'l	1915	1916	1917	Tot'l	1915	1916	1917	Tot'l
Ben Davis x Ben Davis	50	230	192	472	0	11	0	11	0	4.7	0	2.33
Ben Davis x Grimes	331	156	207	697	116	3	11	133	.31	1.9	6.76	19.08
Ben Davis x Jonathan	134	708	208	1350	118	11	22	151	27.10	1.55	10.58	11.10
Ben Davis x Winesap	200	78	217	495	13	1	0	1	0	1.3	0	.20
Grimes x Grimes	100	256	86	442	29	2	6	37	29.00	.78	6.97	8.37
Grimes x Ben Davis	330	220	177	727	73	23	28	121	22.12	10.4	15.82	17.05
Grimes x Jonathan	286	131	239	659	75	18	27	120	26.22	13.4	12.13	18.20
Grimes x Winesap	118	216	91	425	11	6	4	21	11.86	2.77	1.39	5.64
Jonathan x Jonathan	168	57	227	452	17	0	0	17	10.11	0	0	3.76
Jonathan x Ben Davis	790	621	221	1632	96	11	0	107	12.10	1.77	0	6.63
Jonathan x Grimes	392	239	230	861	34	1	13	48	8.65	.41	5.65	5.57
Jonathan x Winesap	200	113	203	516	14	0	0	11	7.00	0	0	2.71
Winesap x Winesap	118	115	287	550	1	0	1	2	.85	0	.35	.36
Winesap x Ben Davis	250	398	108	756	15	0	12	27	6.00	0	11.11	2.57
Winesap x Grimes	110	166	101	380	1	0	1	5	3.63	0	.96	1.39
Winesap x Jonathan	500	76	300	876	35	0	1	36	7.00	0	.33	4.10

TABLE II.—THREE-YEAR AVERAGE DESCRIPTIVE DATA OF HAND-POLLINATED APPLES

Variety Crossed		No. of Specimens Studied	Average Diameter in M.M.		Form	Color		Quality
Female	Male		Long	Transverse		Ground	Per Cent Over Color	
Ben Davis x Ben Davis	11	54	66	Conic	Greenish	51	Ben Davis
Ben Davis x Grimes	130	55	68	"	Yellow	54	"
Ben Davis x Jonathan	151	54	67	"	"	51	"
Ben Davis x Winesap	14	56	64	"	"	52	"
Grimes x Grimes	8	50	57	Truncate	"	00	Grimes
Grimes x Ben Davis	102	55	57	"	"	00	"
Grimes x Jonathan	113	55	57	"	"	00	"
Grimes x Winesap	23	53	58	"	"	00	"
Jonathan x Jonathan	16	54	64	Roundish	"	43	Jonathan
Jonathan x Ben Davis	107	58	67	Conic	"	56	"
Jonathan x Grimes	47	53	60	"	"	49	"
Jonathan x Winesap	14	59	69	"	"	71	"
Winesap x Winesap	2	52	62	Roundish	"	82	Winesap
Winesap x Ben Davis	24	47	57	"	"	76	"
Winesap x Grimes	4	51	63	"	"	95	"
Winesap x Jonathan	35	51	60	"	"	63	"

bulletin. The commercial and practical application of the facts obtained by this study justify apple growers in planting varieties, primarily for the benefit of cross-pollination, which will cause the normal development of the apple. Varieties should be planted together which have the greatest mutual affinity, in order to secure the highest per cent of cross-pollinated specimens, but no benefit is derived on size, color, shape and quality of the apple of the female parent from foreign pollen. Pollination data for three years showing the varieties crossed, number of pollinations made, number of fruits harvested and the per cent of fruit set is given in Table I.

In 1915 there were made 4380 pollinations with 568 fruits harvested for all varieties. In 1916 3813 pollinations were made, giving only 76 fruits harvested for all varieties. For 1917 3097 pollinations were made, producing 129 apples. For the three years 11,290 pollinations were made which produced 773 apples of all varieties.

The most successful year for pollination work was 1915. During that year, when Grimes was used as a female, the highest per cent of fruit was set. Self-pollinated Grimes also produced the best set. As a female, Ben Davis, Jonathan and Winesap were second, third and fourth, respectively, for the per cent of fruit set each year. Also for the three-year average. Poorest results were secured in 1916. The total per cent of fruit set for the three years for Grimes as a female, using the other three varieties as male, was 49.26. Ben

Davis, as a female, produced 32.71 per cent of fruit; Jonathan, as a female, produced 18.67 per cent of fruit, while the Winesap, as a female, produced 9.42 per cent. The Winesap, as a female, gave consistently the smallest number of fruits and was the most difficult variety from which to secure pollen or work with. The Ben Davis, as a female, crossed with Grimes, gave a total of 19.08 per cent of fruit set, placing this cross first and indicating the most satisfactory mutual affinity of the four varieties used. The Grimes and Jonathan, as a male, produced 18.20 per cent of fruit set. Grimes and Ben Davis, as a male, gave a total of 17.05 per cent of fruit, which ranks this combination as third. It will be noted from Table I that some crosses failed to produce fruit during certain years. This is particularly true of 1916. Climatic conditions were extremely unfavorable during this year and not much more favorable during 1917. The factors which cause failure in pollination work need not be discussed in connection with this study, but it is important to note that a small number of specimens, particularly self-pollinated specimens, were secured. However, each year all hand-pollinated specimens possessed the characters of the female parent in size, color, shape and quality, regardless of the number of specimens secured. Perfect pollination is essential to normal development of the apple.

Table II is composed of the average descriptive data of hand-pollinated apples, given as collected for three years. The figures are the average for

this period except the number of specimens studied, in which case the number given for each cross represents all of the specimens secured.

The measurement in millimeters ran fairly constant each year for the same crosses. All crosses ran slightly larger in 1915, a wet year.

The form of all crosses consistently each year was that of the female parent. Differentiation of the ground colors was impractical, as all of the specimens possessed the common greenish-yellow ground color at picking time. This gradually changed according to the degree of maturity that the specimens reached by the date that they were described. It was impossible to detect any variation of the ground color of any of the crosses which would indicate the action of any particular pollen. The ground color is, therefore, that which is characteristic of the female parent for each variety.

The per cent of over-color in 1915 was decidedly higher than for 1916 or 1917, thus indicating that heat and moisture conditions play an important part on size and color. It was noticeable that self-pollinated specimens of Winesap contained practically 100 per cent red, or over-color, while in 1917 they contained only 60 per cent over-color. This held true for all self-pollinated specimens.

The per cent of over-color of each cross fluctuated from year to year. It is particularly noticeable that the use of other pollen did not increase the per cent of over-color over the self-pollinated specimens. The self-pollinated Grimes possessed no over-color, as might be expected. Neither did any of the other crosses with Grimes possess over-color. It is noticeable that when Grimes pollen was used on Ben Davis that the Ben Davis apples possessed 54 per cent over-color, while the Winesap pollen, a red variety, used on Ben Davis, produced Ben Davis apples with only 52 per cent over-color. This would seem to prove that the influence of the pollen of the male parent is nil on the color of the fruit of the female parent. In the case of self-pollinated Jonathan these apples possessed 43 per cent of over-color, while the Jonathan crossed with Grimes, a yellow variety, contained 6 per cent more over-color. It does not seem probable that the Grimes, carrying practically no over-color itself, as grown in this community, and shown by its own performance record, would have the ability to increase color on Jonathan when the Grimes is used as a male parent. The same condition holds true by the use of Grimes on Winesap, where such crosses were 5 per cent more colored than self-pollinated Winesap. The Winesap-Jonathan cross was 17 per cent lower than self-pollinated Winesap and 32 per cent lower than Winesap crossed with Grimes. The difference in per cent of over-color is due to the form of growth of tree, the type of pruning, the location of the hand-pollinated specimens on the tree, and particularly to the environmental conditions of the year. It is significant to note in Table II the average per cent

of color of all crosses in 1915 is 75 as compared with 22 per cent for 1916 and 30 per cent for 1917. This would indicate the influence of other factors on color instead of pollen, as the same parents were used each year.

The estimation of quality of all crosses varied according to the maturity of the specimens and the influence of storage factors, but particularly varied according to the judgment of the individuals testing the specimens for this character. It is thought best not to list this factor in such terms as fair, good or excellent, as they are only relative terms. Each year it was distinctly noticeable that the quality of all crosses was that of the female parent, making allowances for the influence of the above factors. It is, therefore, believed to be most satisfactory to record quality for the female variety which is possessed as a variety characteristic.

Summary

1. This article contains data collected in 1915-16-17, of the effect of cross-pollination on size, color, shape and quality of the apple.

2. Ben Davis, Jonathan, Winesap and Grimes were selected for this study.

3. Data collected during this work shows the necessity of cross-pollination.

4. The commercial value of this study is based upon the detriment or advantage of the pollen of any variety increasing or detracting from the size, color, shape or quality of the fruit of the female parent.

5. Recognized practices of emasculation and hand-pollination were maintained each year.

6. A total of 11,290 pollinations were made, which produced 773 apples.

7. The apple when grown under different conditions varies in all of the characters mentioned.

8. A resume of the work of investigators conducting experiments related to this subject confirms the data in this article.

9. Improper pollination will cause abnormal development of the apple, but other causes may also cause the apple to develop improperly.

10. A distinct color band as found on apple occasionally did not occur among any of the hand-pollinated specimens.

11. Light is the most important factor on color. Color may be hastened by mechanical, insect or disease injury. Date of picking influences the color of the apple.

12. Plant food, temperature and moisture are important factors in modifying size and shape.

13. Self-pollinated apples of Grimes, Ben Davis, Jonathan and Winesap were similar in every respect to cross-pollinated specimens.

14. In self-pollinated specimens both the striped and the solid type of coloring is found. Similar coloring is found in orchards where pollination is not under control.

15. A two-year survey of twenty orchards in Washington County produced evidence that environment is responsible for modification of size,

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color, shape and quality of the apple. Also a study of 94 specimens, including 14 varieties, from the Idaho Experiment Station.

16. The apple when grown under different conditions varies in all of the characters mentioned.

17. The total per cent of fruit set for the three years for Grimes, as a female, was 49.26, Ben Davis 32.71, Jonathan 18.67, and Winesap 9.42.

18. The greatest mutual affinity exists between varieties as follows: Ben Davis (female) x Grimes, Grimes (female) x Jonathan, Grimes (female) x Ben Davis, Ben Davis (female) x Jonathan.

19. The commercial and practical application of the facts obtained by this study justify apple growers in planting varieties primarily for the benefit of cross-pollination to secure the normal development of the apple.

20. No influence of the male pollen of any variety can be detected on size, color, shape and quality of the fruit of the female parent.

Conclusions

The results of this study for the three years seem to justify the following conclusions:

1. No influence of the male pollen of any variety can be detected on size, color, shape and quality of the female parent.

2. The commercial and practical application of the facts obtained by this study justify apple growers in planting varieties primarily for the benefit of cross-pollination to secure the normal development of the apple.

BETTER FRUIT

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Purchase Early.—In many cases the fruit grower waits until he is actually in need of a tool or implement before he purchases or even learns if the store in his local town has stock on hand. The grower, who in the past has been accustomed to delay his buying in this manner, will find conditions considerably changed, and if he wishes to be equipped with all the necessary machinery when he is in need of same, he must purchase in advance. From now on until late in the spring fruit growers will be purchasing spray machines. Every grower should look over his old machine, if he has one, and make sure at once if he needs a new one, and if so he should make his plans early, decide the kind he wishes and place his order. This will not only insure the grower getting his machine and having it when he wishes to use it, but it will help the manufacturers; and we all know that many of the manufacturing concerns are meeting with much difficulty in securing the necessary supplies, and it will be a big assistance in aiding transportation by helping to relieve the congested condition of the freight traffic. To produce a clean crop of fruit that will command a good price, a fruit grower must be equipped with a first-class spray outfit, of the make that is best suited to his needs or fancy, and by purchasing early the fruit grower is not only helping himself and the manufacturer but he is performing a patriotic duty. It is foolish for a grower to attempt to produce a clean crop with a worn-out spray outfit. There are many first-class makes of machines on the market, but the grower must not expect to get a good machine at a cheap price, and it is poor economy to try to save a few dollars at the expense of a good outfit. We urge every grower who is intending to purchase a spray outfit to give the matter his early consideration.

Unprofitable Varieties of Fruit.—We publish elsewhere in this edition a list of the varieties of fruit that the Pacific Coast Association of Nurserymen, at their annual convention held in Portland last July, name as unprofitable. For many years different districts have been producing varieties of fruit that do not pay the cost of production. When the fruit grower ships fruit that does not pay the cost of harvesting and transportation he not only does not make money but he crowds the market with undesirable fruit, which lowers the price on the good varieties and good grades. But what is more important now is the fact that it utilizes the shipping space that is needed for the varieties and grades that pay the grower a fair profit. Every fruit grower should study this list carefully;

if his orchard contains any of the varieties named in this list he should graft them with good commercial varieties that are suited to his district or dig them up and replant. Big prices have been paid for all varieties of high-grade fruit, and no fruit grower can afford to pay the cost of cultivation, spraying and harvesting varieties that do not bring the top market price.

The Newtown Pippin.—The original Newtown Pippin tree was a seedling, located about two hundred years ago in Newtown, Long Island. It is said to have died about the year 1805 from excessive cutting of scions and exhaustion. In the first year of Queen Victoria's reign, Andrew Stevenson, whose home was on the mountainside of Albemarle, was minister to the Court of St. James. Some of these apples were sent to him and he presented the Queen with several barrels. She was delighted with the flavor and excellence of the apple, and as a graceful acknowledgment of the courtesy of Mr. Stevenson, removed from this variety of apples a small tax which then existed for the benefit of the Crown on all imported apples. From this time the Albemarle Pippin has grown steadily in favor in the English markets.

Pruning.—In this edition of BETTER FRUIT appear some valuable articles on pruning. During the next few months we intend to devote considerable space to this subject. The Northwest realizes that, to compete with other apple sections, it is necessary to produce a high-class product and pruning is one of the most important factors in aiding the grower to produce an apple that is of uniform size that will command a high price on Eastern markets. Pruning is also an important factor in assisting the grower to lessen the fungous diseases. The continued standing of moisture on fruits or foliage from rain or fog is very favorable to the germination of many fungous spores, but by pruning so as to admit plenty of light and air to all parts of the tree the proper drying takes place—the air and sunshine are allowed to penetrate and the grower will learn that the fungous spores are considerably lessened.

Steinhardt & Kelly, it is reported, have purchased the entire tonnage of the members of the Umpqua Valley Fruit Growers' Union, of Roseburg, Oregon. It consists largely of Newtowns, Ortleys and Spitzenburgs. White Salmon, Washington, announces the sale of their entire output to Steinhardt & Kelly, which will amount to about one hundred carloads, and it is said to be one of the cleanest crops they have ever purchased.

Anthracnose.—Many fruit growers of the Northwest suffer severely from anthracnose. Completion of harvesting should be followed immediately by thorough spraying, and the sooner it is done the better. In this issue we publish an excellent and timely article by Professor Childs, "Apple Tree Anthracnose and Its Control," which should be

studied carefully by every fruit grower. If a fruit grower should be fortunate enough to have his orchard free of this disease, but if his neighbor has anthracnose, then he should spray as a preventive.

From November 11th to 18th we are asked to give \$170,500,000. This is the largest single gift ever asked of any people at one time, but it embraces the work of seven organizations: Young Men's Christian Association, Young Women's Christian Association, National Catholic War Council and Knights of Columbus, War Camp Community Service, Jewish Welfare Board, American Library Association, and the Salvation Army. There were many who thought these organizations could not be consolidated, but when President Wilson made the suggestion that they get together, the impossible was achieved in a day. It is not much to ask for to provide comfort for our boys under arms—less than ten cents a day for each boy; and it will be raised—everyone will give to the limit, because everyone has learned how to give, and, after all, how little it is when the boys at the front are giving their lives.

Box Strapping.—It is not too late to again call the attention of fruit growers to box strapping. A few broken packages means a severe loss to a grower, not only this year, but in future years. The dealer who receives packages in first-class condition is anxious to receive more from the same shipper. Fruit growers should give the matter more thought and see that boxes for long distance shipments are strapped with a good box strapping.

Packing Corporation.—Fruit growers of the Yakima Valley are realizing eight dollars per ton for cull apples. The California Packing Corporation has opened its fruit-drying plant and expects to handle about 40,000 tons of apples during the season, which will mean about \$320,000 for the fruit growers of Yakima Valley for cull apples.

The interest in the nut industry of the Northwest is rapidly increasing. One of the busiest men at the Oregon State Fair was Mr. Ferd Groner, who had a small booth where he showed a fine display of nuts, and also some young trees pulled up by the roots, showing the remarkable growth they had made in one year. The crop this year is one of the finest ever produced and walnut growers will make good money. The Northwest produces very high class nuts, which command big prices.

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United War Work Campaign

AT the request of President Wilson, seven great organizations who are engaged in works of mercy among the American soldiers and those of her Allies, have combined in one United War Work Campaign so as to better carry on their work and to prevent duplication of efforts, repeated requests for funds, etc. These organizations are the Y. M. C. A., Y. W. C. A., National War Work Council K. of C., Jewish Welfare Board, War Camp Community Service, American Library Association and the Salvation Army. They are holding a drive to raise \$170,500,000, beginning November 11th and lasting until November 18th.

It is of the utmost importance that this sum be raised. Each of these organizations is doing a splendid work for our soldier boys. They are amusing and entertaining him when he is well, caring for him when he is sick, serving him in the stress of battle, curing his homesickness and increasing his morale and encouraging him to be a better soldier and a better man. They have expended of their time, energy and money to the utmost. The funds given to them in the past are about exhausted. While the amount that they have had looks large, remember that it has to be expended for the welfare of more than four million boys—the amount for each one is small and yet it is enough to make every soldier happier and more contented.

The money has been and will be wisely expended. The men engaged in the field work are doing so at a great sacrifice. It is a body of picked men, men who in civil life could earn two or three times the amount of money that they will get for their services in the army. All that they demand or secure is just sufficient to live upon. The financial question asked a prospective secretary is not "How much salary do you demand?" but "How much do you need to supplement your fixed income, in order to live?" All the money that you have given and will give, minus a small portion for the actual expenses for the men engaged in

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Good standard grades. Well made. Quick shipments.
Carloads or less. Get our prices.

Western Pine Box Sales Co.
SPOKANE, WASH.

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

A Continuous Chain of Boiling Points

—gives easy starting, quick
and smooth acceleration,
power and mileage, in Red
Crown gasoline.

STANDARD OIL COMPANY
(California)



The Gasoline of Quality

the work, goes to insuring the welfare, comfort and happiness of your boy.

The money will be needed for a long time, for while peace rumors may be hovering in the air and it is possible that peace may be declared even before

this story is published, it will in nowise lessen the need for this money to care for the boys. In fact, it will be more important after the war than before, because, first, during the period of reconstruction a large foreign army will

Rubber Footwear at the "Front"

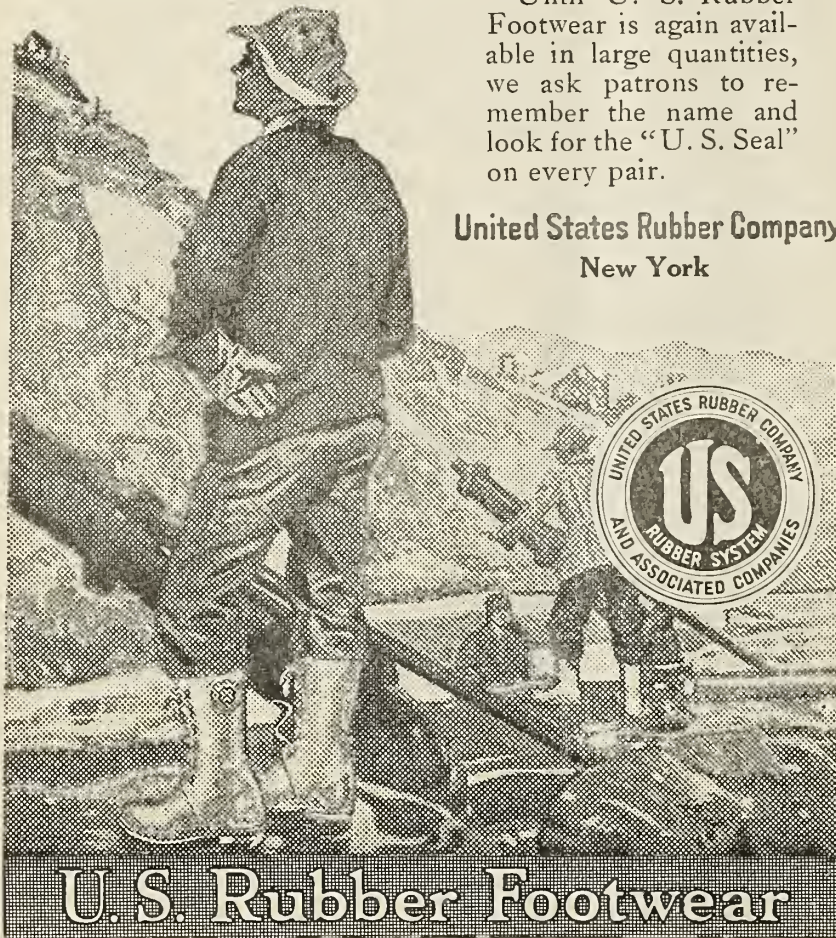
In the first line trenches, where the need is greatest, rubber footwear is helping to make life more livable for the doughboy.

Men in the trenches are being supplied before civilians at home. This means limited supplies for outdoor workers.

Our customers, we are confident, will cheerfully bear with this situation. We regret our inability at present to meet every demand for "U. S. Protected" footwear.

Until U. S. Rubber Footwear is again available in large quantities, we ask patrons to remember the name and look for the "U. S. Seal" on every pair.

United States Rubber Company
New York



the nation's industries. War is our business, it is your business and mine. Every commercial interest must be pushed aside. He has the right of way. Therefore, he is commanding practically all the shipping upon the high seas and commerce has been forced to take the crumbs falling from the war lord's table.

But, after peace, commerce will have all of the shipping facilities in the world at its command. It is necessary for the economic conditions in America that our commerce does not die. Commerce will reassert itself; our goods will be transported to foreign shores and we will receive again our accustomed supplies from them. War being no longer the master nor his commands imperative, large portions of the ships will be engaged in peaceful avocations, bringing supplies from every corner of the world. Therefore, there will not be the same number of ships for the transportation of men and munitions back to America that there has been to carry them abroad. It has taken more than a year to transport our army to foreign shores. Consequently it will require a longer time to return them and muster them out of the service.

During the waiting period it will be much harder to amuse, entertain and satisfy the alert young American. He has been bolstered up to bear almost impossible hardships by the enthusiasm of the war. His fighting blood was up. He has been satisfied to give up places of profit and live in tents and to shoulder a musket and sleep on the bare ground while he was fighting. But when the incentive is removed, this same patriotic young American will want to come home, to begin again the American chase for the American dollar. He will want to see mother ten times more, and the longing for black-eyed Susan will be increased a thousandfold, and he won't be able to see, after his job is done, why he is being kept in France. He also will have more leisure time in which to go to the huts. Yes, the task of keeping him satisfied and contented and keeping up his morale will be tripled. The secretaries are a great comfort and aid to him now; they will be a necessity then. They will be needed more than ever to keep him out of mischief and protect his morals. He has been too busy fighting for the last two years to be subject to much temptation, but the allurements of the city and its bright lights will attract him. These efforts to amuse and entertain him, the athletic exercises, the field contests, the plays and motion pictures, will then be in direct competition with the vices of the city to attract the American soldier boy. The moral influences and the clean sports must be made strong enough and pleasant and virile enough to win in this competition. If you want your boy to come back wholesome and sound of body and limb, bright eyed and clean, you must aid these organizations in their efforts to protect him. The work ahead of them is stupendous—the importance of it is more than stupendous. It rests with you to supply the funds necessary to carry it on.

APPLES

PEARS

ORANGES

For European Distribution
Boxed Apples and Pears a Specialty

GERALD DA COSTA

100 & 101, Long Acre, Covent Garden, London, W. C. 2, England

Cables: "Geracost, London."

Codes: A. B. C. 5th Edition and Private

Shipping Agents: Lunham & Moore, Produce Exchange, New York

be necessary in order to insure the enforcement of the peace terms and also for police duty in the disorganized sections of Northern France and in Germany. If we are to secure the full fruits of our victory we must have an armed force on hand to enforce the

mandates of the Allies. This will require almost all of our present army and navy now abroad. Furthermore, when it is feasible to return them to America, it will be impossible to do so at once because of the shortage of ships. At present war is master of all

Unprofitable Varieties of Fruit

Following is the report of the committee on elimination of unprofitable varieties, as adopted by the Pacific Coast Association of Nurserymen, at their sixteenth annual convention, held at Portland, Oregon, July 10 to 12, 1918:

The task assigned to this committee is of such magnitude that we can only hope to make a beginning at this time. After careful thought and discussion we recommend that the following list of names of fruit trees be dropped from our catalogs and budding lists, and their sale discontinued. Nurserymen who have been making specialties of certain varieties may choose to push such, but unless it is one of merit and demand we would discourage such action.

Apples:

Akin.	Orengo.
Am. Sum. Pearmain.	Palouse.
Antonovka.	Pattons Greening.
Arkansas Beauty.	Pecks Pleasant.
Autumn Strawberry.	Peter.
Babbitt.	Pewaukee.
Bailey Sweet.	Pryors Red.
Belle de Boskoop.	Rambo.
Benton Co. Beauty.	Rawles Janet.
Black Ben Davis.	Red Bellflower.
Blenheim Orange.	Red Canada.
Blue Pearmain.	Red Gravenstein.
British Columbia.	Red Russian.
Canada Reinette.	Romanite.
Coopers Market.	Roxbury Russet.
Coos River Beauty.	Salome.
Dutch Mignonne.	Scotts Winter.
Early Colton.	Seek-no-further.
Early Strawberry.	Senator.
English Russet.	Shackelford.
Fallwater.	Sierra Beauty.
Fall Jenneting.	Skinner's Seedling.
Fall Pippin.	Smiths Cider.
Gideon.	Spokane Beauty.
Gloria Mundi.	Springdale.
Goal.	Stark.
Golden Sweet.	St. Lawrence.
Haas.	Stump.
Hoover.	Summer Queen.
Hub. Nonesuch.	Suttons Beauty.
Hydes King.	Swaar.
Ideal.	Sweet June.
Iowa Blush.	Tetofsky.
Isham Sweet.	Twenty Ounce.
Jersey Sweet.	Vandevere.
Keswick Codlin.	Walbridge.
King David.	Waldron Beauty.
Lamber Twig.	Williams Favorite.
Longfield.	Willow Twig.
Mam.	Winterstein.
Okabena.	Wismers Dessert.
Ontario.	York Imperial.
Opalescent.	

Crab Apples:

Alaska.	General Grant.
Excelsior.	Minnesota.

Pears:

Bessemlanka.	Le Conte.
Crocker's Bartlett.	Lincoln Coreless.
Dearborn Seedling.	Madeline.
Doyenne de Ette.	Mt. Vernon.
Duch. de Angouleme.	Pound.
Easter Beurree.	Pratts Seedling.
Garber.	Sou. de Congress.
Idaho.	Tonkoveithka.
Kennedy.	Vermont Beauty.
Koonce.	Vicar.
Lawson.	Wilder.

Cherries:

Allen.	Knights Ey. Blk.
Baldwin.	Ostheime.
Centennial.	Oxheart.
Chapman.	Roe.
Deacon.	Vladimir.
Dyehouse.	Windsor.
Gov. Wood.	Yellow Spanish.
Hoskins.	

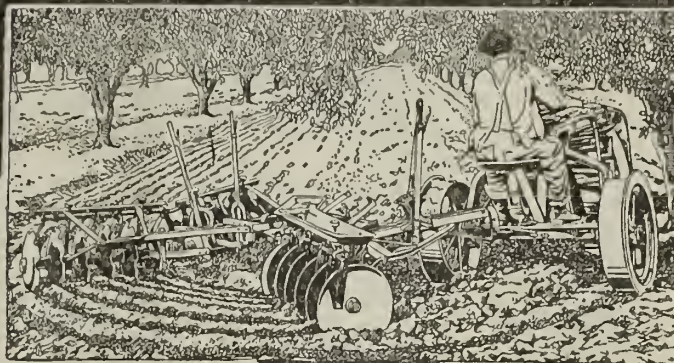
Prunes:

Champion.	Golden.
Dosch.	Splendor.
Glant.	Tennant.

Plums:

America.	Hale.
Apple.	Jellico.
Bartlett.	Moores Arctic.
Chaleo.	Pottawattamie.
Chas. Downing.	Shippers Pride.
Clyman.	Sultan.
Combination.	Washington.
Forest Rose.	Weaver.
Gaviota.	Wild Goose.

Note What It Does



How Special TrackPULL Tractor Works Orchards, Vineyards

Tractors are too important to buy without first **getting all the reasons** to show why some are **better than others for your particular kind of work.**

The Bean TrackPULL Book tells plainly why you need a **Bean Tractor** if you want **orchard and vineyard** work. Worth its weight in gold because it posts you on vital qualities in such a tractor. You know what **your** tractor must do. Send for catalogs of all tractor makers and compare with **Bean TrackPULL Book.** Then decide on your tractor.

The Bean TrackPULL operates through **single track**, which does all pulling and steering. **Full power on turns** same as on straightaway. Makes

no difference how far off center you hitch—pulls just the same. Works close to trees and vines. Pulls, "gees." "haws" and backs just like team. 12-year-old boys can handle.

Made by manufacturers of orchard machinery for 34 years. All their specialized experience built into it.

Advanced improvements in Motor, Track Rollers, Drive Sprocket, Bearings and Rear Wheels make the Bean the most efficient orchard and vineyard machine ever manufactured.

Get invaluable **Bean TrackPULL Book Now**—send the coupon before you forget it. Save money. Learn name of nearest agent who can show machine.

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Send me catalog and full information without obligation on my part

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- 2—Track Rollers—Provided with hardened steel thrust bearings.
- 3—Drive Sprocket—Solid steel ring, machine cut, hardened and heat treated assures long service.
- 4—Bearings—Provided with improved dust protected greasing facilities.
- 5—Rear Wheels—Provided with dust cap, wear resisting bushings and improved greasing facilities.

Name.....
Street.....
City.....
County..... State.....
No. of acres.....
Kind of crops grown.....

Peaches:

Amsden.	Mountain Rose.
Australian Sauter.	Newhall.
Banner.	Orange Cling.
Bokhara.	Oregon.
California Cling.	Prolific.
Chinese Cling.	Runyons Orange.
George 4th.	Sneed.
Gillingham.	Strawberry.
Golden Cling.	Susquehanna.
Greensboro.	Van Buren.
Henrietta Cling.	Wager.
Imperial.	Wheatland.
Levys Late.	Wonderful.

Nectarines:

Early Violet.	Humbolt.
Lord Napier.	Yakamine.

Apricots:

Alexander.	Hemskirk.
Alexis.	Nicholas.
Gibb.	Peach.

Almonds:

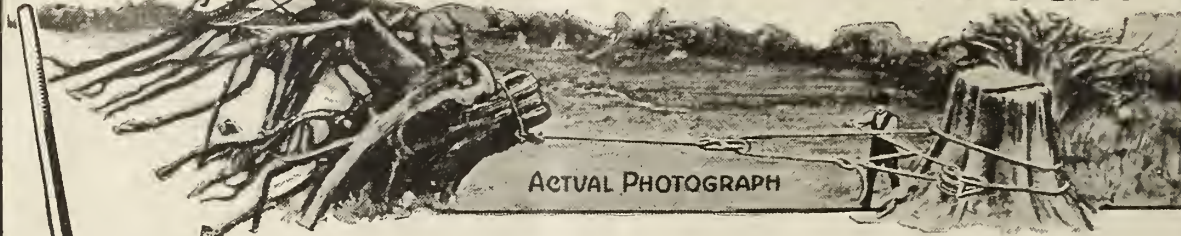
Bidwells Mammoth.	Oregon Prolific.
Harriotts Seedling.	

In this connection we wish to call attention to the recommendation of the American Pomological Society with respect to the nomenclature of our catalogs, to the end that superfluous portions of names be dropped in cataloging them, and that synonyms be used only where they have come into such general use in certain localities that the proper names are almost unknown, so that it would be confusing to use them.

Committee: Albert Brownell, chairman; C. D. Hobbs, secretary; M. R. Jackson, F. W. May and J. A. McGee.

Mr. W. Chester Ferguson of Yakima, Washington, realized an average of \$2,016 per acre for pears this year.

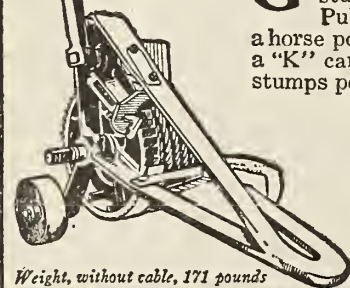
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GRASP the OPPORTUNITY and put DOLLARS in your pocket by clearing your stump land. Stump land was never so valuable as it is TO-DAY. The "K" Stump Puller will do the work in less time and the least expense. Cost just about $\frac{1}{2}$ of a horse power machine and about $\frac{1}{4}$ of the cost of dynamite. One man or woman with a "K" can out pull 16 large horses. One person single handed can pull from 50 to 150 stumps per day.

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Weight, without cable, 171 pounds

**No stump
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"K"**

works by leverage—same principle as a jack—one man can lift or pull 48 tons alone. Works easy as rowing a boat. Works on hillsides or marshes where horses cannot operate. Has 2 speeds and weighs 171 pounds. Made of the best steel. Absolutely guaranteed against breakage. Endorsed by U. S. Government officials. Highest bank references.

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Box 53 182 Fifth St., San Francisco, Calif.

Peach Leaf Curl and How to Control It

By John T. Bregger, Oregon Agricultural College

IT is now the time when peach growers are looking forward to the annual spraying campaign against peach leaf curl. It is the wintering habit of this fungus which makes it one of the easiest of fungous diseases to control. The spores which carry the fungus over winter are believed to be lodged on the bud scales, and for this reason the growers find it absolutely necessary to spray before the buds begin to open in the spring. Neglect to do this very thing has been the cause of practically all their failure to control this disease in the past. If once the bud scales start to open, it is then too late, as the fungus has already entered the new leaves which are beginning to unfold.

The successful growers are going to profit by the experience of the last few years in regard to peach leaf curl and determine beforehand the necessary measures to take in order to keep this disease down as much as possible. Perhaps a brief description of the disease will make the reasons for the control measures clear.

Peach leaf curl is a disease which manifests itself early in the year on the new leaves. The symptoms are very plain and well known. Most of the damage, however, occurs from the distortion and early shriveling or falling of the leaves. Although this seldom causes the death of the tree, there is a considerable loss of vigor, resulting in poor growth and small crop, which is of serious consequence and highly desirable to avoid. Ordinarily, the disease confines itself to the foliage, although in many cases it is found on the twigs and fruit, producing "clubbing"

of the twigs and reddish blotches on the peaches. The prevalence of the curl in a particular orchard is largely dependent upon the variety of peaches grown, and also upon the locality and weather. Leaf curl is favored by cold, wet weather when the leaves are opening. Areas not far from the ocean or inland bodies of water, having slow-drying dews and cold, misty springs, are most liable to be subject to epidemics of the

disease. The Elberta peach seems to be the most susceptible. Pierce says that the annual loss in the United States from this disease is about \$3,000,000. This is caused by the loss of vigor due to shedding of leaves, and also to the weakened condition for going into winter. This last condition in some cases will make winter-killing possible.

Growers of peaches in various parts of the Western fruit sections have proved that either bordeaux mixture or winter-strength lime-sulphur will control the peach leaf curl efficiently. Bor-



Berger & Carter Company

MANUFACTURERS AND JOBBING DISTRIBUTORS OF

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FOR THE

Food Preserving Industries

Home Offices:
17th and Mississippi Streets
San Francisco, Cal.

Division Offices: { Los Angeles
Portland
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Pittsburgh Perfect Cement Coated Nails are of the highest standard

The Heads don't come off. Given Preference by Largest Pacific Coast Packers

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A. C. RULOFSON COMPANY, Pacific Coast Agents
359 Monadnock Building, San Francisco, California

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

"Hep! Hep!" Ten miles more to hike—then camp and the comforts of a little chew of Real Gravely.



See That He Never Lacks a pouch of Real GRAVELY Chewing Plug

Your fighting man will go to almost any lengths to get good tobacco. Many a man has paid \$5 for less good tobacco than you will send him in a pouch of Real Gravely Chewing Plug. Only costs you 10 cents.

Give any man a chew of Real Gravely Plug, and he will tell you that's the kind to send. Send the best!

Ordinary plug is false economy. It cost less per week to chew Real Gravely, because a small chew of it lasts a long while.

If you smoke a pipe, slice Gravely with your knife and add a little to your smoking tobacco. It will give flavor—improve your smoke.

SEND YOUR FRIEND IN THE U. S. SERVICE A POUCH OF GRAVELY

Dealers all around here carry it in 10c. pouches. A 3c. stamp will put it into his hands in any Training Camp or Seaport of the U. S. A. Even "over there" a 3c stamp will take it to him. Your dealer will supply envelope and give you official directions how to address it.

P. B. GRAVELY TOBACCO CO., Danville, Va.

The Patent Pouch keeps it Fresh and Clean and Good

—It is not Real Gravely without this Protection Seal

Established 1831



deaux is, in the experience of most of them, a more reliable material for the curl, and this is applied winter strength (6-6-50). If San Jose scale is known to be present, however, winter-

SULPHUR



It has been proven and so recommended by the University of California that if you sulphur your grape vines and orchards 6 times they will not be affected by MILDEW or RED SPIDERS.

ANCHOR Brand Velvet Flowers of Sulphur, also EAGLE Brand, Fleur de Soufre, packed in double sacks, are the fluffiest and PUREST sulphurs that money can buy; the best for vineyards; the best for bleaching purposes, LEAVING NO ASH.

Try our new brand of VENTILATED Sublimed Sulphur, 100 per cent pure, for making Paste—(Atomic Sulphur) and for Dusting.

For Lime-Sulphur Solution, use our DIAMOND "S" Brand Refined Flour Sulphur. We can furnish you this sulphur at such a low price that it will pay you to mix your own solution.

To create additional available plant food, drill into the soil 100 to 400 pounds per acre of our Diamond "S" Brand Powdered Sulphur. It has been proven that sulphur has increased various crops up to 350%.

Save this advertisement for reference, as it may not appear again.

Write immediately to Balfour, Guthrie & Co., Portland, Oregon, or Seattle, Washington, our representatives, or direct to

San Francisco Sulphur Co.

624 California St. San Francisco, Cal.

We are equipped to make immediate shipment. SEND FOR ILLUSTRATED BOOK-LET, PRICE LIST AND SAMPLES.

WANTED, MRS. JORDAN

and 1,000 other women poultry keepers to write P. J. Kelly, 219 Kelly Bldg., Minneapolis, Minn., for his new text book on how to make lazy hens lay. The book will be mailed FREE.

strength lime-sulphur (1-8) is employed, as it will control both pests, while bordeaux will control only the leaf curl.

Probably the greatest drawback to efficient spraying has been that of rainy and muddy weather. The progressive grower, therefore, finds it important to take advantage of the earliest spell of good weather, when the condition of the ground will permit, for his leaf-curl spraying. Experiments have shown that spraying as early as December in Oregon will bring successful results, and that March is too late for safety. Complete control cannot be expected unless every bud on the tree is thoroughly covered with the spray. Many of the unsuccessful growers fail because they spray at a tree with little attention to the matter of how complete a coating they are putting on.

If fruit growers will continually bear in mind the nature of this leaf-curl disease and realize that it is easy to control completely, if only the proper precautions are taken in regard to fighting it, there will be no more severe epidemics in the future. Furthermore, even the small outbreaks and minor losses can be eliminated by the proper application of the simple control measures.

The fruit growers of the Northwest were pleased to receive the message from Washington, D. C., that the Interstate Commerce Commission has agreed to lower the freight rate on apples to \$1.10 per barrel for this year. The former rate was \$1.25, and the growers put up a very strong plea to have the rate reduced to \$1.00 per barrel. But the saving of 15 cents per hundred in the freight rate for apples from Wash-

ington and Oregon points to Chicago and points east means a big saving to the apple industry of the Northwest.

They wear like iron—

Mayer

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Ask your dealer for Mayer Shoes. Look for the trade-mark on sole.

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Western Branch:
Washington Shoe Mfg. Co., Seattle, Wash.

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MILTON, OREGON
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ZEROLENE

The Standard Oil for Motor Cars

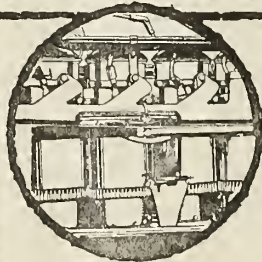
The Popular Motor Oil

More ZEROLENE is used for automobiles on the Pacific Coast than all other oils combined.

Leading motor car distributors praise ZEROLENE, correctly refined from selected California asphalt-base crude, because it maintains its lubricating body at cylinder heat and gives perfect lubrication with less wear and less carbon deposit. Get our lubrication chart showing the correct consistency for your car.

At dealers everywhere and Standard Oil
Service Stations

STANDARD OIL COMPANY
(California)



Engines are either water-cooled or air-cooled. This, the air-cooled type, like all internal combustion engines, requires an oil that holds its full lubricating qualities at cylinder heat, burns clean in the combustion chambers and goes out with exhaust. ZEROLENE fills these requirements perfectly, because it is correctly refined from selected California asphalt-base crude.

Pruning the Bearing Tree

Continued from page 6.

pear trees should never be cut very much; that it makes a sappy growth susceptible to blight, and there are many evidences that there is much truth in the last statement. It is very interesting to visit the orchard of Mr. Sawyer of Toppenish, Washington. Mr. Sawyer has one of the largest pear orchards in that country, is in an irrigated section and has had his orchard in alfalfa sod for eighteen years. He prunes very heavily and as a result he gets a good growth, has little or no propping to do and has a heavy yield. He is in a section where blight occurs, but he seemingly has little trouble with this disease. Mr. Sawyer may be unorthodox, nevertheless his orchard is a good testimonial of the soundness of his views and is worth the serious consideration of pear growers.

Since there is a great interest in the Italian prune, a few words to our prune growers will be of some aid to them. There are three kinds of wood on the average prune tree. First, the upright strong branching wood or staghorn wood, so to speak. This wood has a mighty bright future. Second, there is the wood which grows out horizontally. This wood has had a wonderful past, a fair present but an unpromising future, and, third, the drooping wood; all it has is a past. In other words, the staghorn wood is beginning to bear, and in the near future will not only produce the most of the prunes on the tree, but also the largest ones. The horizontal wood, while still producing lots of prunes, is setting less and less blossoms and is tending to produce small fruit. The drooping wood may bloom, but it is generally too weak to produce fruit or, if it does produce, the fruit will be found to be of inferior quality. The problem of the prune, then, is to keep plenty of staghorn wood coming into the tree and keep removing the drooping wood. Many of our old prune trees should sacrifice one-fourth to one-half of their wood. Such a removal would immediately revitalize the remaining spurs and buds left on the trees; more fruit, larger sizes and new, vigorous wood is the result. Much of this drooping wood can be most cheaply and easily removed by putting on an old pair of gloves and simply breaking it out. Where a good, vigorous sprout appears on a prune tree, remove some of the older wood next to it and give the sprout a chance to develop. Badly devitalized trees can be dehorned and new sprouts developed into fruitful tops in four years, but this should not be done unless necessary, as a vigorous thinning out will often revitalize many trees without the loss of the crop for three or four years. Most of our stone fruits such as the prune and the cherries are often short lived owing to heart rots which develop. These heart-rots fungi get their foothold in wounds. The wounds in not only such trees but in all trees should be carefully protected. Copper nails could be used where they are easily procured, driving them into the cut surface, the copper

killing out the decaying fungi. This is a practice that is being used in parts of California. The Bordeaux paste, however, as recommended by the Plant Pathology Department of this institution, is very good and made as follows:

Bluestone Solution.—Dissolve 1½ pounds of bluestone (copper sulphate or blue vitriol) in 1 gallon of water in a wooden, earthenware or glass vessel. This is best done by suspending the chemical in a bag of loosely-woven cloth or burlap, at the top of the water, or by pounding the lumps into small bits and dissolving by use of hot water. This solution attacks metals actively.

Lime Paste.—Slake 3 pounds of quick lime with 1 gallon of water, in the ordinary manner.

Mix in Equal Parts.—When the lime is cool enough, equal parts of the bluestone solution and the lime paste should be mixed together thoroughly. Mix only enough at one time for a day's use. Apply like whitewash with a brush. The stock bluestone solution and stock supply of slaked lime can be kept indefinitely if not mixed together, provided water is added occasionally to keep solutions up to the original volume.

Apply this paste to all wounds and strive in every way to keep decay from entering the trees. Many a prune tree which looks all right from the outside has really only a few years left owing to the fact that the decays have riddled the wood of trunk and branch, and in a strong wind, some day, such a tree will be sacrificed.

Pruning of Cane Fruits

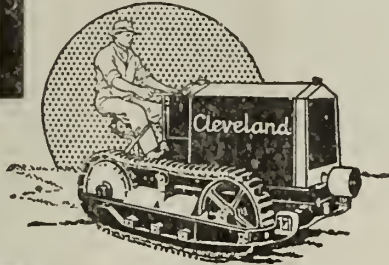
The pruning of bush fruits is very frequently misunderstood. In the early days of growing raspberries and blackberries in the Puyallup Valley the growers adopted the policy of planting the berries in hills five feet apart, and to prune the new canes at the top when they reached a height of about four feet, but in later years they learned the advisability of not pruning the top of the cane at any time of the growing season, and to permit it to grow just as tall as possible, and to plant the canes in the row system about three feet apart in the row.

During the winter months, after the leaves have fallen off, side arms are trimmed off. This leaves a long whip-shaped cane. This cane is taken care of, either on a wire or permitted to lay over a hop pole, with the result that it gives a much heavier crop and a much longer crop-producing season, as the first berry ripening will be up on the very top of this long cane, and the berries will continue to ripen from the top bud to the bottom bud, the later crop coming on on the lower buds.

The grower who cuts off the top of his bush berries is cutting away at least 25 per cent of the crop, and in addition to this he is arranging so his crop will all mature at one time, or nearly so, instead of having a six weeks' ripening season, as he will have with canes on which the tops are not cut, as against a three weeks' ripening season on the canes that are cut back.—*W. H. Paulhamus, Puyallup, Wash.*

FARMERS

all admit that the greater part of farm work--discing, harrowing, cultivating, seeding, manure spreading, etc., must be done on plowed or soft ground--also in plowing the low soft spots and hill-sides must be considered.



Then in orchard work another requirement enters--making short

turns--working close to trees and under low limbs.

All of these requirements are met by the

Cleveland Tractors McNeff Tractor Company

NORTHWEST DISTRIBUTORS

DUDLEY BUILDING
Yakima, Wash.

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Portland, Oregon

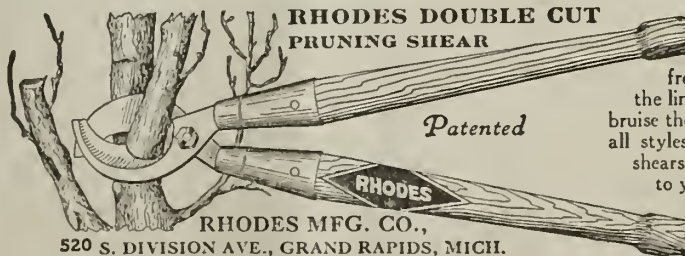
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Pruning by Principle

By Harvey Currin, Sunnysdale Orchards, Drain, Oregon

THE method we have used with most success in teaching men to prune is by impressing upon them the principles of pruning, the effects and results of different cuts and reasons why, rather than by showing them how to prune. A knowledge gained in this way makes for more intelligent and less mechanical work, enabling the pruner to vary his treatment to suit each particular case. The importance of this is evident, since trees of different varieties and ages and

under different cultural methods, conditions of growth and vitality each presents quite a different problem, requiring different pruning treatment.

The pruning of young trees require imagination. Whether pruning to the open-center, leader, or modification of either type, one must have in mind the ideal characteristics the tree should have at the bearing age, then prune to direct the whole energies of the tree toward that end. The prime considera-

tions are, first, strength to hold a maximum load; second, a form with fruiting area as accessible as possible, yet not interfering with cultivation, and, third, an abundance of fruiting wood well distributed where the tree can best bear the load and with sufficient light to enable the fruit buds to function and the fruit to color. Strength may be promoted by avoiding crotches, having the main branches spread on the trunk and issue at a good angle, and by keeping the fruiting area not too far from the central axis of the tree. The natural graft by intertwining shoots is a cheap and efficient means of strengthening the main branches and preventing excessive spread during the early bearing stage.

Some hold that it is best to allow the tree to begin bearing gradually, starting the fourth or fifth year, maintaining that to bring them in with a bang the seventh or eighth year makes for alternate bearing. The writer is inclined to favor holding back the fruiting until the tree has attained a profitable bearing size, then bring them in with a bang and endeavor by careful thinning, pruning and good cultivation to make them hang the following year and each year following. Scattering, desultory fruiting before the tree can bear a paying crop is a detriment. It checks the wood growth and delays the time when the tree will begin paying a profit. The spraying on such crops is usually done at a loss, and if not done these scattering fruits will increase the brood of worms throughout the orchard before the trees do attain profitable bearing. Grow a big tree quickly and the fruiting balance will be easily established by allowing the top to catch up with the roots.

The one big principle to keep in mind is that the formation of fruit spurs, fruit buds and the ability of those buds to blossom is a matter of nutrition. The supply of nourishment a bud receives decides its action and this supply depends upon the supply of both sap and sunlight to the leaves surrounding the bud. The lack of either means starvation. The sap cannot be used by the buds until it has first been digested or transformed into starch. This is brought about only in the leaves and by action of sunlight. The control of the supply of both sap and sunlight to the leaves is in the hands of the pruner. Let us examine the effects of different treatment. The removal of too much wood destroys the balance between the top and roots. In its effort to correct this the tree throws out wood growth, forcing many would-be-fruit buds into watersprouts which shade and choke other fruit buds. Thus fruit buds are starved for sunlight on account of too much sap. Too little pruning might result in starvation for either or both. A lack of wood growth indicates a poor supply of sap and some wood should be removed that the balance may be fully supplied. If there is abundance of wood growth the removal of some is necessary that the balance may receive enough light to properly nourish its fruit buds. The



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pruner should be able to judge by the amount and character of the wood growth and fruit buds just what treatment the tree requires to give it the right fruiting balance.

In removing wood many pruners make the mistake of cutting back each year a portion of the current year's

growth, their idea being to keep the tree within profitable reach. There is a better way to accomplish this without the evil effects. It is the upper buds on a shoot that are stronger and more capable of producing fruit spurs. In removing the upper two-thirds the best buds are thrown away and the in-

ferior ones retained. Further, it will be noticed that each cut will result in two or three shoots, causing a blanket effect over the top of the tree to shade and choke the more valuable lower fruiting wood. A better way to keep the tree low and open is to thin out, cutting the taller branches to lower



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lateral growth. This takes less cuts, less time and results in less shoots. If the cuts are made close, leaving no stubs or knots, these robber shoots are less likely to form and the wounds will heal quickly with less danger of heart rot. In choosing between two branches it is usually best to remove the straight thrifty ones, as crooks and rebranching are conducive to fruitfulness.

While pruning may be done at any time, some advantage is gained by pruning in winter trees that lack vigor and during the growing season where the growth is excessive. On varieties such as Winesap and Jonathan, which tend toward over-bearing and undersized fruit, rather heavy winter pruning or heading back in the spring soon after the fruit sets may be practiced to correct this fault as well as to reduce the thinning expense. Trees making excessive growth are usually shy or tardy bearers. If the balance can once be restored and they be thrown into heavy fruiting, the excessive growth will cease. This may be accomplished by omitting cultivation or irrigation and pruning during the late summer when the growth has been checked for lack of moisture. Pruning at this time increases the light and sap supply for the balance when most needed to nourish the fruit buds that are to produce the following season. To overcome the alternate year bearing habit, prune, thin and cultivate thoroughly during the bearing season, otherwise the heavy crop will sap the vitality of the tree, robbing the fruit buds that are to produce the following crop. A deep plowing during the off season will cut feeders and reduce over-bearing the alternate year.

Burning Leaves Aids Disease Control.

Burning leaves in the fall is recommended by specialists in plant diseases at the Ohio Experiment Station at Wooster for the control of several diseases which attack shade trees. Spraying trees with bordeaux mixture is also advised in severe outbreaks of some diseases. Elm trees are attacked by a leaf spot which sometimes results in defoliation. This disease appears as hard black spots on the upper side of the leaves. The leaves of poplar are often affected by a similar fungus, but the spots are light colored. The leaves of young elm are often covered with a white powdery mildew. The disease lives over winter as spores on the leaves. The anthracnose fungus produces large brown areas on maple and oak leaves. The rest of the leaf may appear green and healthy. The leaves may carry these diseases over from one year to the next. Raking and burning them, therefore, will aid in checking the spread of the diseases. Where valuable young trees are threatened by such diseases as powdery mildew or anthracnose, spraying with 4-4-50 bordeaux mixture is recommended, but during the fall the destruction of affected leaves is beneficial to insure the future value of the shade tree.

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